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February 6, 1975

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1. Title of the Invention: Air sterilization and purification apparatus

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5. List of Appended Documents

(1) Specification
(2) Drawings
(3) Duplicate Copy of Application
1 set
1 set
2 set
3 period of Application
4 set
5 set
6 set
7 set
8 set
9 set
1 set
1 set

(4) Power of Attorney 1 set Method Examination

(5) Request for Examination 1 set

[illegible stamp]

Specification

1. Name of the Invention: Air Sterilization and Purification Apparatus

2. Scope of Patent Claims

In an air purification apparatus that passes positively charged airborne dust between opposing electrodes, an air sterilization and purification apparatus wherein air is caused to pass through while inducing a separation phenomenon by switching the direction of flow of air that passes through the aforementioned opposing electrodes and modifying a cross section of the passage.

3. Detailed Description of the Invention

The invention of the present application is one that relates to an air sterilization and purification apparatus, and in a purification device that causes airborne dust particles to be absorbed by static electricity, relates to a device capable of raising dust removal effectiveness, and is intended to achieve an air sterilization and purification apparatus that, in particular, is made up of a combination of novel and ever simpler elements, is manufactured by a simple process with lower costs of production, and that, with excellent safety, is capable of achieving even better results in use.

Along with the development of heavy industry, air pollution from sources at each stage of the production process, nitrous oxide and sulfur dioxide emitted from transportation sources, and heavy metal particulates, have steadily increased. The widespread expansion of pollution has become an issue of serious concern to society, and various regulations have been proposed to prevent pollution, including preventing the generation of toxic materials as well as the strengthening of emissions standards. These approaches, however, cannot be considered adequate, and there are a growing number of people who suffer from lung cancer and other cancers as well as an increase in the number of people suffering from asthma. Air purifiers have become a common and indispensable part of life and are to be found installed in homes and sickrooms to prevent and/or treat these illnesses, and are used as prevention or treatment devices in the production stages of sanitary pharmaceuticals, foods, devices, and are also employed in the production of precision machinery.

A variety of devices have been suggested to cleanse the air by removing airborne toxic materials. Among those are air purifiers that use filter materials in air flow passageways to physically collect the dust, or electrical air purification devices such as dust removers that make use of static electricity or infrared rays to disinfect the air, or a combination of any of these approaches in order to remove toxic materials.

Among these, suggestions for conventional devices based on the aforementioned use of static electricity are known, including, for example, (a) an approach utilizing centrifugal force designed such that air, induced from an air inlet, passes through an ionization element while electrical voltage is applied to the inner and outer cylinders while the inner cylinder rotates, moving the air between the inner and outer cylinders, and (b) an approach where, in the above configuration, the outer circumference of an inner cylinder has inclined guide vanes provided in the axial direction along the outer circumference of the inner cylinder and rotational movement is applied to the air as it passes through between the inner and outer cylinders to make use of centrifugal force.

The above mentioned approaches have attempted combined dust collection by the use of electrostatic migration and centrifugal force, however, because high voltages with 11 KV in between the inner and outer cylinders, and as a result of rotating the induced air, a rectified electricity may be generated due to frictional resistance depending upon the air flow rate, and electric discharge sparks may occur between the dust particles that have collected onto the external cylinder, frequently causing risk of electrocution as well as the increased production of ozone and possible malfunction of the device.

In view of the above, research conducted by the inventors of the present application have overcome and eliminated the well known defects described above, and have perfected a device that is superior in terms of safety and that markedly increases the efficiency with which dust is adsorbed. The invention comprises a fan motor; an inner cylindrical electrode that has a

built-in high-voltage transformer, and that is connected to the positive side; a high voltage cap connected to the negative side; an external cylindrical electrode that is earthed; and a housing that has openings on both sides, and that is supported by a pedestal. On occasion that airborne dust that is guided into the unit through the upper inlet passes through an ionization section high-voltage cap that is connected on the negative side, a positive charge is applied to the dust, and it is guided into the electrostatic field between the grounded outer cylindrical electrode and the positive inner cylindrical electrode, and as a result of the electrostatic induction effect, airborne dust passing through is adsorbed onto the surface of the outer cylindrical electrode. Thus, the present invention is characterized by having opposing electrodes that have a plurality of parallel curved surfaces and a plurality of convex curved surfaces or recessed curved surfaces on the inner cylinder and an outer cylinder provided with a plurality of parallel curved surfaces and a plurality of convex curved surfaces or recessed surfaces, wherein the convex curved surfaces or recessed surfaces of the inner cylinder and the convex surfaces or recessed surfaces of the outer cylinder alternate with each other. By creating an electrostatic field between these opposing cylinders, the direction of the flow of air passing through them can be alternated, and the flow passageway cross section can be altered so that the flow rate fluctuates, thereby creating a flow separation phenomenon. This causes the generation of a stagnant flow, a reverse flow, or a turbulent flow of air that contains dust. The intention here is to extend the duration of the effect of the electrostatic adsorption on the outer cylindrical electrode surface and to increase in the efficiency of dust removal. The next object of this invention is to provide a device with superior safety. Additionally, an object of the invention is to provide a simple and compact mechanism that can be made available at low cost and that can be placed easily in a variety of locations, as well as to provide a device that allows simple, easy, and safe cleaning of the panel upon which the dust has been adsorbed. Other objects and characteristics of the present invention can be understood. from the following explanation.

In Figs. 1 through 5, a housing acceptor cylinder (5) is supported on a stand (1) by means of a shaft (2) upon which a support board (4) consisting of insulating material and provided with exhaust windows (3); an external cylinder accepting cylinder (7) is mounted on the edge of the lower opening section of said housing; an exhaust windows (6') is arranged in the external cylinder barrel (7); and a fan motor (8) is internally installed in a motor cap (9). The fan motor (8) (for practical purposes, preferably with a maximum torque of $1040 \pm 10\%$) is connected to a power source, and the motor cap (9) has a built-in high-voltage transformer (11) that is connected to a power source. An inner tube electrode (14) made of metal and provided with stepwise alternating vertical curved surfaces (12) and convex curved surfaces (13) is installed onto the positive side of the high-voltage transformer, and a rounded-head inner cap (16) made of insulating material and continuing the multiple outer cylinder support [illegible] (15), (15) is mounted in the top opening of this inner cylindrical electrode (14). A metallic high voltage cap (18) that is provided with a limit switch (17) is installed in this cap (16) and connected to the negative side of the high-voltage transformer and a metallic outer cylindrical electrode (22) provided with stepwise alternating vertical curved surfaces (20) and recessed curved surfaces (21) on the upper opening edge step section (19) of the outer cylinder acceptor (7). The vertical arced surfaces (20) and the recessed arced surfaces (21) are positioned so as to face the swelling arced surfaces (12) on the inner cylindrical electrode (14) and the vertical arced surfaces (12) on the inner cylindrical electrode (14) with each other, respectively. The external cylindrical electrode (22) faces the inner cylindrical electrode (14). According to FIG. 1, an air inlet window (23) is arranged in the upper opening of the external cylindrical electrode (22), and a retainer plate (25) made of insulating material is provided on the bottom limit switch retainer element (24). Next,

the housing (27) is installed on the upper opening of the outer perimeter section (26) of the housing acceptor cylinder (5), which is installed on the support board (4). A head section retaining cylinder (28) is installed at the top section of this opening, and an air inlet window (29) is provided in this upper opening and a connector board (31) made of insulating material and provided with dust-proof mesh/screen (30) that is connected by means of bolts (32) to the retainer plate (25), air inlet windows (29), and air inlet windows (23), and is configured so that air passes between the inner and outer electrodes, the exhaust windows (6), and the exhaust windows (3), and is circulated to the outside when the fan motor (8) is operating.

At this time, when the high voltage transformer (11) and power source are connected by a switch, which is separately arranged (in practical terms, an input voltage of 100 V AC and output voltage of 7 KV DC are preferable) the airborne dust that is introduced [into the unit] is positively charged in the vicinity of the transformer (11), by the inner cylindrical electrode (14) that has been connected to the positive side by means of the electrostatic induction between the inner and outer electrodes, and is migrated to the external cylindrical electrodes (22) and clung to its walls.

Here, the direction of the air flow that is passing through the convex curved surfaces (12) and vertical curved surfaces (13) provided on the inner cylindrical electrode (14) is switched by the vertical curved surfaces (20) and recessed curved surfaces (21) provided on the outer cylindrical electrodes (22), and as a result of the change in the cross section layer between these electrodes, the spacing between the vertical curved surfaces (12), (20) of both electrodes should be approximately 20 mm; the spacing between the vertical curved surfaces (21) on the outer cylindrical electrodes (22) and the convex surfaces (13) on the inner cylindrical electrodes (14) should be approximately 16 mm; and the spacing between the recessed curved surfaces (21) on the outer cylindrical electrodes (22) and the vertical curved surfaces (12) on the inner cylindrical electrode (14) should be approximately 25 mm, for practical purposes. The recessed curved surfaces (21) should be 5 mm in diameter, while the convex curved surfaces (13) should be 4 mm in diameter. There is a change in flow rate, and the separation phenomenon is augmented. As a result, the dust-bearing air flow stagnates, reverses or becomes turbulent, thereby extending the duration for electrostatic adsorption and increasing dust collection efficiency (Fig. 6).

In the cross sectional configuration of the above mentioned both electrodes described above, in another embodiment, the convex curved surfaces (13) of the inner cylindrical electrodes (14) could have a gentle linear flow [illegible] convex curved surfaces (13) on the upstream side to intensify the switching of the direction of flow and the change in the flow passageway cross section, making it that much easier for the separation phenomenon to occur, forming lead (33) between the convex curved surfaces (13), (13) for a configuration that augments electrostatic induction. (Fig. 7)

Moreover, as a separate embodiment, convex curved surfaces (34) with gentle flow lines are formed on the upstream side of the outer cylindrical electrodes (22), and both flow line convex curved surfaces (34) and flow line convex curved surfaces (35) are positioned so they oppose one another, thereby intensifying the switching of the direction of flow and the change in the flow passageway cross section, extending the duration in which adsorption occurs due to stagnation, reverse flow, and turbulent flow of the dust-containing air (Fig. 8).

With regard to removal of dust clung onto the surfaces of the outer cylindrical electrodes, the power to electrode (22) is removed along with the retainer plate (25) by removing the connector board (31) and by pulling up and removing the head section retaining cylinder (28) and the housing (27), and after cleaning these, it is easy to restore them to their original state and join together. At this time, the retainer element (24) of the retainer plate (25) is separated from the limit switch

(17), thereby breaking off the flow of current between the high-voltage transformer (11) and the power source, so that there is no risk of electrocution.

As configured above, the present invention extends the duration of the cling effect on the outer cylindrical electrode by means of electrostatic induction of the dust-carrying air that passes between the electrodes, thereby increasing the efficiency of dust removal and reducing mold spores and yeast fungus.

Moreover, this is a particularly safe device since there is no danger that frictional force and resulting rectified electricity will be generated as a result of centrifugal force as the air passes through the unit, and the risk of malfunction due to sparking electric discharge between the adsorbed dust particles resulting in electrocution or explosion can be prevented, and the generation of ozone can be suppressed.

Also, given the device's simple and compact configuration, it can be manufactured less expensively, and it is also easy to move.

4. Brief Description of the Drawings

Figure 1 is a front view. Figure 2 is a plan view. Figure 3 is a view of the bottom surface. Figure 4 is a cross-sectional view along the A-A line in Figure 1. Figure 5 is a cross-sectional view along the B-B line in Figure 1. Figure 6 is an enlarged view of the area indicated by the letter E in Figure 4. Figure 7 is an enlarged flow line cross section diagram of another embodiment. Figure 8 is an enlarged flow line cross section diagram of yet another embodiment.

Applicant: Kyowa Seiko, Ltd. Agent: Hiraki MIURA [seal]



西罗克克克斯森斯

5. 数份条款の日級





50 01G060

田口の木田村の

写存をなえられた雰QooLんじんを。 ゴ 才马龙板侧走透照电动马上 9 化七大型双位荷丝 異れかいて、上記四月ナる電布阿モ亜温ナる原体 心病外不可含在其古人。本口就你心情就也不能完 をせるととによって、私食なみでおさせをから生 体を浮がせしめるようにしたととも手吹とする交

本第の長男仗。全年就宣統亦英武长司七、史文 。 P ひふんじんをがせばにょり気がせしめる音が点 ドラいて、その物質対象を付けるととのできる 「乾燥を抑し、とく」に質視で一足単純を発症の初合 を 9。 阿 年 在 工 物 と と 9 数 50 生 変 代 を 以 で 止・ 成者九。水力农业技术优九、上多点W他界段类类 存させたのできる元気電電管を表式を持んとする

我可有工程的成果代码的。专业实现代表化点的

9 日本国特哥厅

公開特許公報

砂料期昭 51-900776 Ø公開日 昭51. (1976) 8. 6 回性麻昭 4.0- 16080 **❷出顧日 昭№. (1975).2.6** 審查請求 厅内整理番号 7033 41

登日本分類 72 CF4

WIALCI? BOJC 1/47

3.大式の矢がかよび前も保みによって て大をく取り上げられてかり、大耳の方共得点ド オと以いえず、大久行業による話述とその他のオ が というんり (単分を) はながら ないしょう 对代据我心灵与故创意化既似心、于时、为《陕心 として現いは又類点上な品、大品、ゼ共平の出せ 衣幣化かいてさらだ又。な常領はのお放政機だか いてサネし、火な上米ぎ久のお衣とをつれ。

七七寸,正集中の守守有其东际穴して針を作の の延済体化かいて何之は、流治無可を用い行成的 成才名(〇四上び野電気利用により気温部点 老上的名人口又红米克莱夫男小家可沙风无期子名 华仪权的代价中化十二的股之口值上记忆故信口点

かせがらによつて有名物式を放売せんとする点系がせざれている。

ため、他に分を収割用におくる集の制度は、対象 えば、切、空深入口から呼入でれた空深が開発 を扱って、可互対に変配を印をおからのかり 背景を、門位の向りを変数しながら通過するとう たした其の方を利用する技術、内の自然を かいて、門位の外別はにいって最初のに対し傾向 かいて、門位の外別はにいって最初のに対し傾向 した現代的ではえ、空深水との門外別の対象 を通過する時に四位温度を考えられるようにし たった流のかを用きてる異常の本知られている。

上四の気がは、背部気の吸引力と残心力との合意製器作品を扱ったものであるが、強力引引可は 例に11天マの方面のを印刷し、以入的保を使用 の世の対象、生気の成果によっては無事が近にこ でせる対象、生気の成果によっては無事が近にこ で被成實はを生じ、外質に吸がされたよんじん よの間に大利はなを止じ、しばしば低ばのかぞん があり、スナソンの荷生食をガスしオソン具を及 動態度上でしくまた。又しばしば成成を生かる の大人を出れるよったので可能化が田屋でもった。 点

なた。在日の日にコマスが何の名はを存しく説明・

共 まごの日にかいて、大切のにより他のますして天本でれる対点は何をおえる西原大可からまる 天正住的に、 スックングをは何を成れる

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4KJ #351-90077 (2)

上四代女子。并为女件关章以研究の伊米上纪念 知切我祭民よる女友を意味教授し、 さらに会心水 だ使れ、ふんじんら異な特帯を一番式めるととの でも工典はもお出したもので、ファンモートル、 不 思トランスを対象しその 作にかめした円 分分点 - 女の気に点非したな丘々ヤップであるしたが白 タサングから書席され、上万人日本も呼入される 是我用力人人也无意。我心诚我们读老礼和何便不 イファの食品がを提出する際、果の実質を与えら れ。毎歳された外質関係と恋の何に無償された行 祖皇前親の御祖郡代母かれ、 千年日を改成代とつ ておおすらをは中の本心でかずればなどになる せしめる保護を属するもので、したべつて水を外 の羽のにより、対向ナルゼ艦は、数値の平行長器 との知の形成似留文は質解製面を共える対解と、 **夕宝莎双握白年行孩前上数据你的商品的人民政治出** 就用但是不外别之它。その行為の非四代百丈收位 海狗城之。外的口口的英雄又从路域城市之党交及。

グング代目内の下方面の関系機に、対気を (o') 七 在计元差权及如专业它 L 大外有关贯彻を发亡。七 の上万年にファンモートル似を内讧した島は大分。 からたるタートルをチョンNをおきし、アナンセ っちへ何し天用的に仏杖ストルクユロチロエスか ガボスというを世界に対象するととかよび、は 也一人火火大力力的上层有些村民或最后都有几点 実施トラアス (13) 七月末し、日本年末年代の (24) と早日共和(28) 七七尺付的尺元以北京廿九七八。 可情電板 (34) を兵犯トランネの玉の道だの泉して とし双翼の外側文文製 (DRL Clas) を延収し大品 保.米 株大歩なる万貨キャップ (MALを選挙して、放子)ナ ァスiaqによくのトライ×ア(jn)を行列した金倉 ロ英氏やイップ (地)をおせい、 ギモトランスの丸 **の食に料料ナスととからび、胃熱化性の質ののよ** 双非口口或类似,(四)长。 化四氢苯酚黄芪黄黄 (如)。 左門 电弧器 (III) 是主教物的民党医院教育大会员(I)。 永貴元氏 (30) 中部をして、その日世末年 (30) 東口 報文庫 (24)の単世 長耳 (立) そか エ (24)の日 東京 (34)

(B) 医克特氏症 (B) 多形现代的 (B) 化对子医管理 ナるとうだなだかりして、方が世代 (14) と別用で 七て荒るし大上。その上が河口有に東京東 (85) を 具え。下側にサミフトスインテの罪え無故 (4) モ 分布丁马克兹布拉尔马尔马斯法杖 (23) 先星发毛、 表 化 時 記宝 丞 遅 仰 吹 祭 が し た ハ ゥ ジ ソ タ 負 質 倒 の 上が同の長れ時初期 (四) につナチング (四) で仮収 し、その上アは口質に同じ神人口(20)を伝統し木 上。その上耳の口器に吸収点 (50) を載けかえび好 周朝(20)を住代した竹林木材中りでる延知度(33) を延告し、メールト DOI で含して対え数(cd) と深 ・おし、付出せれるらしか、ファンサートル何を作 安の歌、兄気は近常之(四)かとび行上京(四)の民 公取 (D) D I C N (25) L 9 。 的。 化阿里宾阿卡油 新毛、养鬼性 (ef。 网络兔鸡で外属灰鸡鱼科 収とする.

上尼西朱선の城區が代化されて、何の東海河として、村田辺県 (14) の出海資河 (15) の上北南東城 東東東南城県出城市 (13)12七元九次四の山南平土が 東西南田市の東北大阪北し、村成東北下一戸町内 代するとともに可らに、放出的美国間 (13)、[12] に 辺前 (23) を経済して曾辺電道を音長する構成とす るとともできる。(何で用)

政化、外貨電視官に負担された本心でんの独立 代担つでは、実際品的な (GII を売り取し、損以付 上質 (M) シェビハググング (M) を引上げて取り扱 した上心得点で (M) とどくに人間を返 (2M) 生別を 伙と時間したほご 医状に含しておなするにとがそ (13) に乗引されたの 佐賀氏 東辺 される。

との制、門間保護 (34) K駅サ大乗収収款 (32) b 医复数蛋白的 七水、外共包包河河 化单分元色仪器 M (80)と日接紙((21)とによって、足丸のお思ナ **品供的方面的现在分词大水面的现在分词现在** 後の名画者(元田台に以芥苑式の名及気型 1324。 [3] 口篇而代析 5 6 次,并谓定报 (3) 0 级长美岩 (22) 上月前世紀(日4) の東田英田 (123) 上の阿林社長 1.4%。从其《篇 (m) 中四角共享 (B) 七四萬萬萬 CM の最高英麗 (14)。との内臓をおまる気とすると と、日子の前馬其貫 (m) 故 a 汽气、母田英寅 (13) はくろうとすることがはましい。10次次によつ て見済水火質し、食力の対災収入で砂夫ナムの影 と大き。とれだよのでか成状気の最充の牙質、気 化深い社會實施主義型之心外有可信用の智能教授 作用時間の延長水明せられた延幼は七揚げしのる ガスとナス。(声・台)

わりて西瓜野島である。との成材人で(2010万人 株材(24)水ヤイットスペッテ(2012と水紙し、写匠 トフンペ 2231と電がとの食品で明づので、品質の かてれを気じない。

東京の延明化、上記の収点によるので、万式成 何を延進する古典記憶水管電影器によって外質な 電源に取製作用時間を延長するので、その取風が 本を集けよっその周本が取る動在はその収率をお するによれてもる。

文、漁港中の交流は、強心力率に入つて無お兵 技能とる基礎を知り発生のかそれはなく。とつて 乗用されたよんじんとの間に火砲波など必須する 球気振いては関係等の関をを承然に対止するとと 水でも、又オンシの発出を決めすることをできる 労会快に使れた供便である。

さら代表表が選挙小形でも30で資承を工成と より式い生取者を以て重要されかつ平面であてお る。

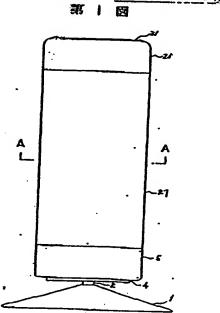
4、据其の資本会試有

新工园住尼城村、新工组校平有级、 **第**3 司政庆

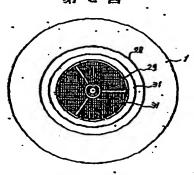
知的、水本自住までのA — A 球化をける成所形成 、スココ以内の一つ時代をける内側的気、ギョ心 住存 4 2000 ける拡大が可見の間、ボッツ以近の形 売食何化をける内拡大所可見ので、ボッカ以び(の) に対し、ボークになける内拡大所可見ので、ボークと、

S

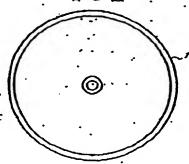
4月 昭51—90077 (4).



第2四

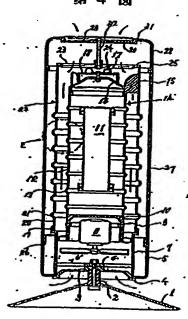


第 3 図

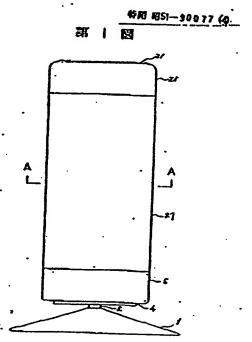


-400

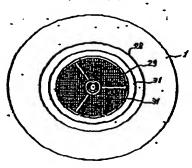
第 4 図



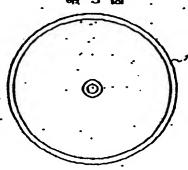
可称、の4位は31万人一人地ドトリンズは同日 、スコゴは月10~12世代シリンのは四日は、VEB は124(125)ける以大が日紀4日。 27月に白代記 死当何にかける月本大統可配金田、28日は5代記 た30天年のにかける月本大統可を設備である。

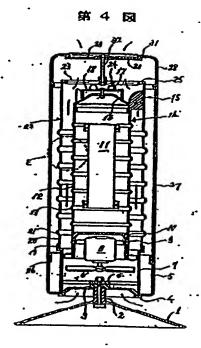


第 2 図



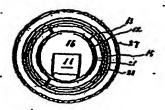
第 3 図

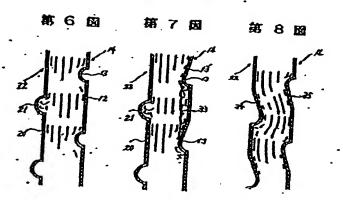




MS1-90077 (5)

苯 5 图





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